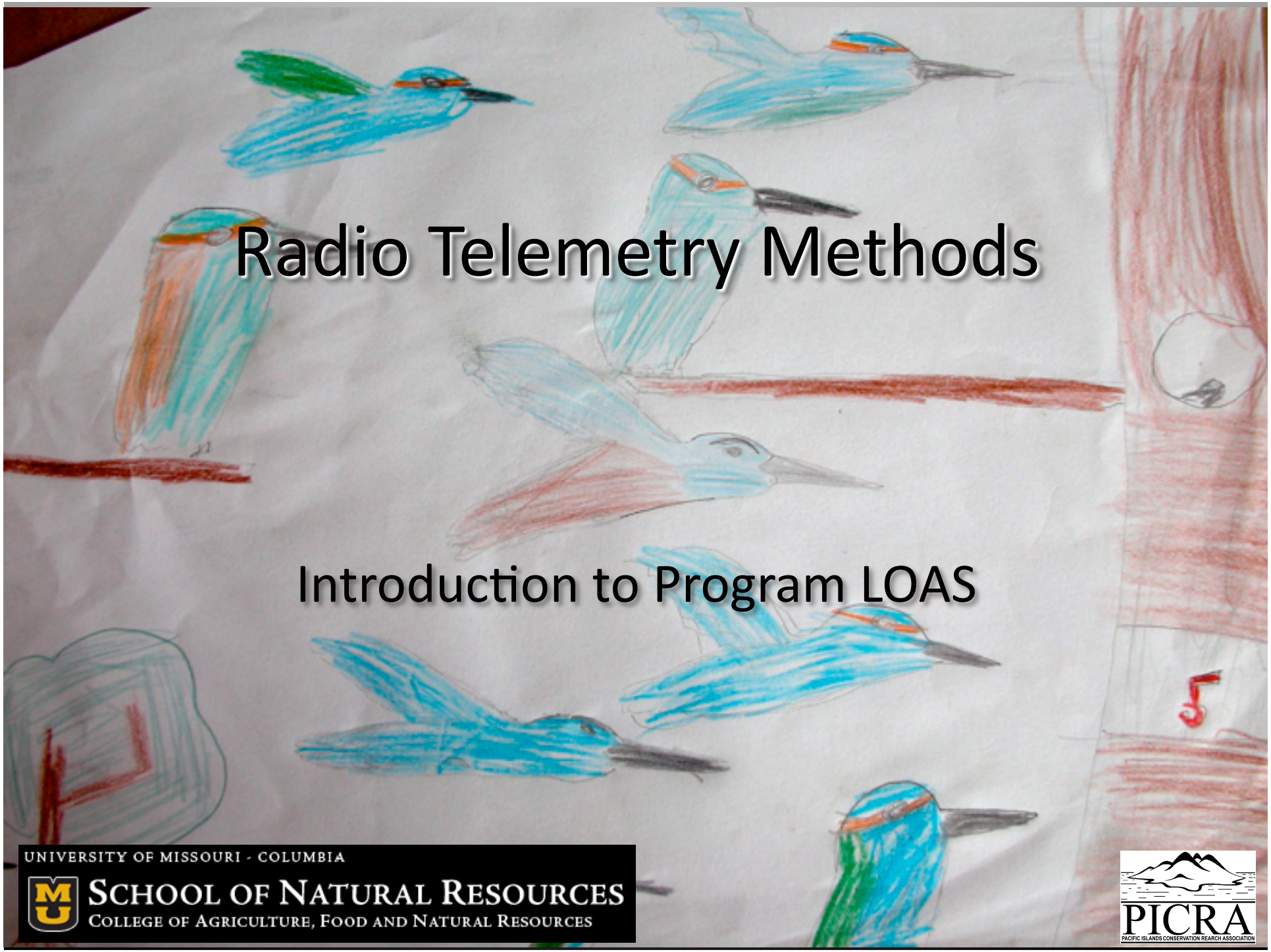

Radio Telemetry Methods
Introduction to Program LOAS
UNIVERSITY OF MISSOURI - COLUMBIA
SCHOOL OF NATURAL RESOURCES
COLLEGE OF AGRICULTURE, FOOD AND NATURAL RESOURCES
PICRA
PACIFIC ISLANDS CONSERVATION REARCH ASSOCIATION

Overview

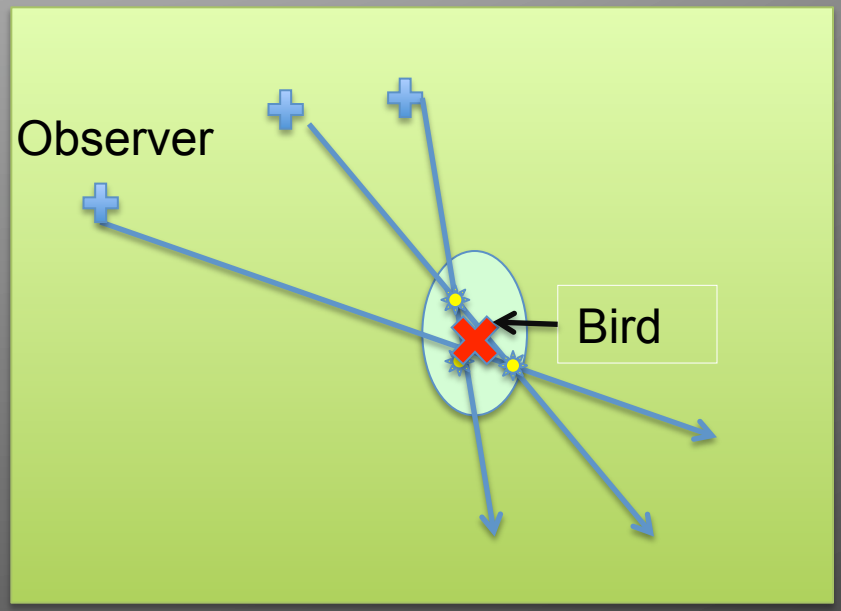
1. *Field data.*
2. *Data preparation for LOAS.*
3. *Importing data into LOAS.*
4. *Marking birds and azimuth groups.*
5. *Selecting estimators.*
6. *Running calculations.*
7. *Exporting data.*

Radio Telemetry

- *Location estimates.*
  - *Two methods.*
  - *Actual observation.*
    - *Potentially more accurate.*
    - *Potential to affect bird behavior.*
  - *Triangulation.*
    - *Detection from a distance.*
    - *Must estimate bird location.*
- *Demography.*
  - *Not addressed in this talk.*

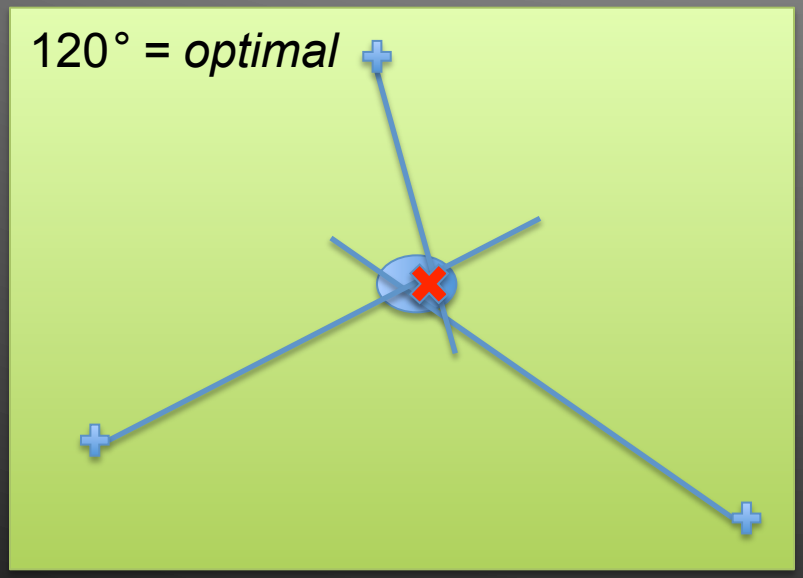
General Overview

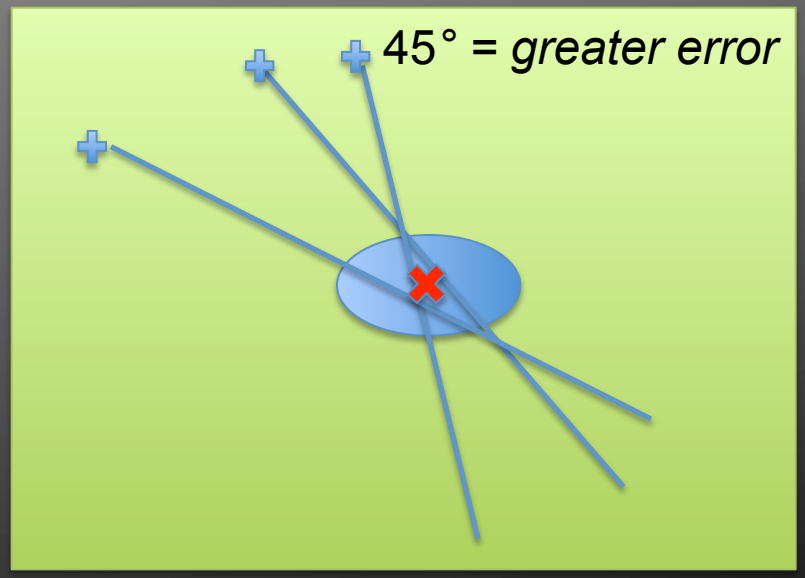
- *Objectives*
  - *Estimate location of bird.*
  - *Estimate error associated with location.*
- *Multiple bearings*
- *Two bearings yield bird location. No estimate of error.*
- *Three+ bearings yield estimate of bird location AND error.*



Field Techniques

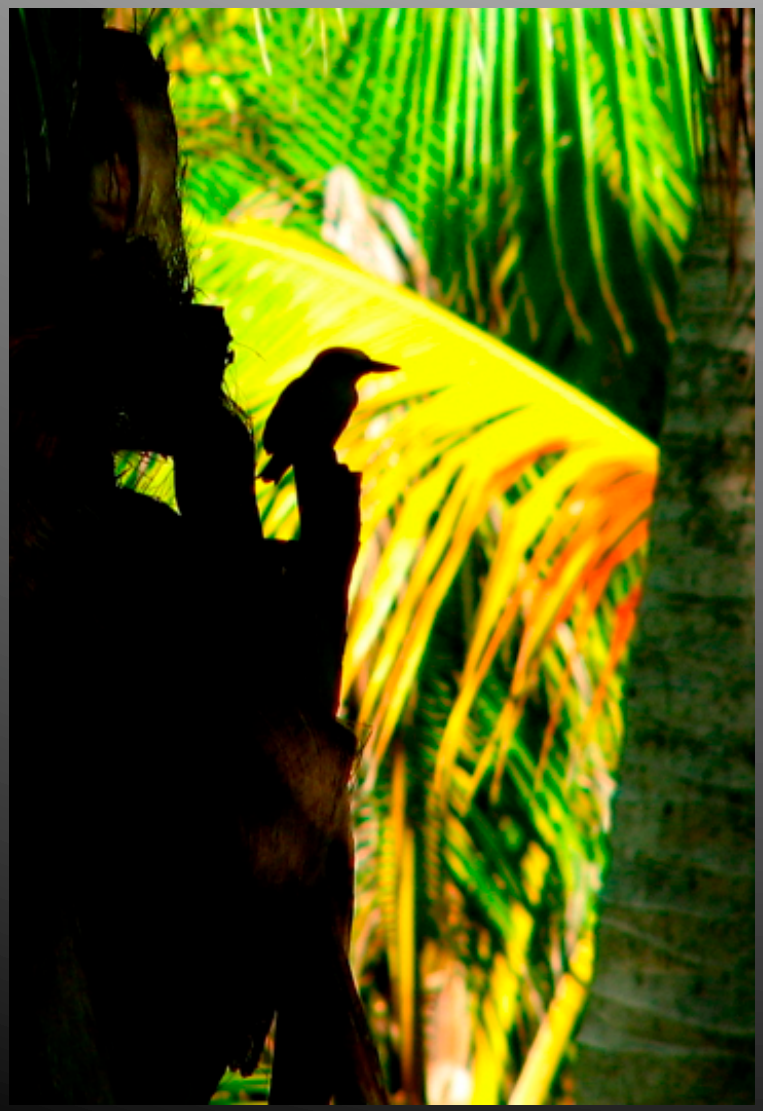
- *Optimizing bearing angles*
  - *Best angles = 360°/x, where x = number of bearings.*
  - *E.g. 360° / 3 bearings = 120°*
- *Multiple bearings*
  - *More bearings is better*





Saltz, D. 1994. Reporting error measures in radio location by triangulation. Journal of Wildlife Management 58:181-184.

Field Exercise



- 1. Record bearing information on data sheets.
- 2. Send one member of group to main computer to enter data.
- 3. Work with data.

Correcting Magnetic Declination

- Concept
  - Magnetic North Pole
  - True North Pole
  - Declination is difference
- Online calculator

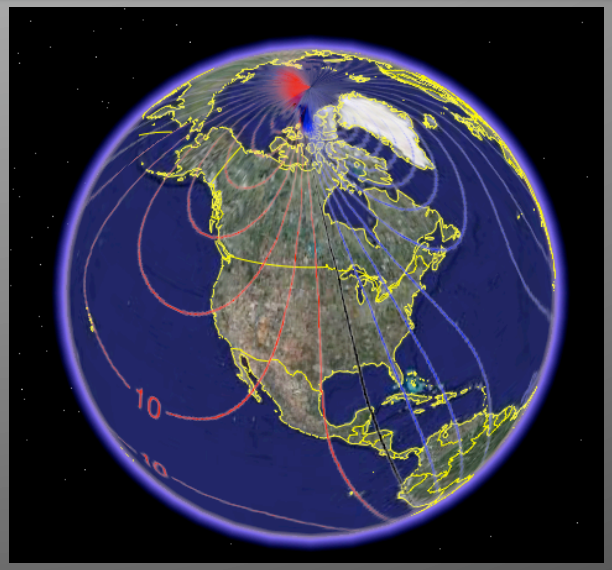
  http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp
- Correction for east

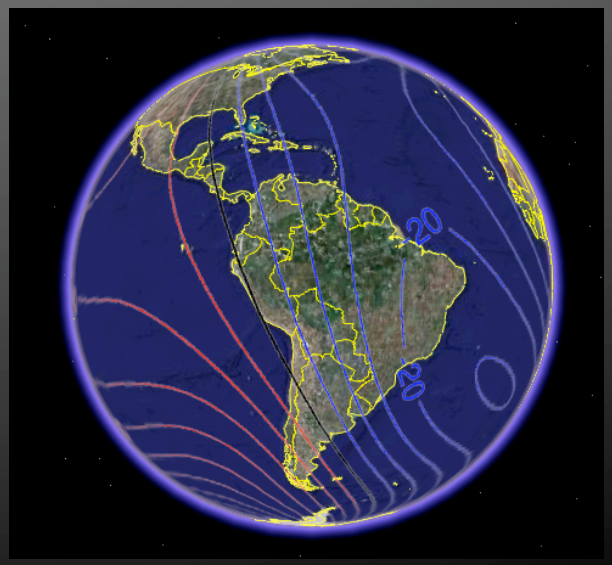
True Azimuth = magnetic bearing – correction
degrees - (correction minutes/60)

e.g.

Mazatlan= 23.1° N 106.2° W

True Azimuth = magnetic bearing - 8° - (37'/60')





Data Required for Location Estimate

Data Needed

1. Your location
2. Azimuth to bird
3. Magnetic declination

http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp

Assumptions

1. Bird is not moving
2. Accuracy of telemetry, azimuth, and declination

Saltz, D. 1994. Reporting error measures in radio location by triangulation. Journal of Wildlife Management 58:181-184.

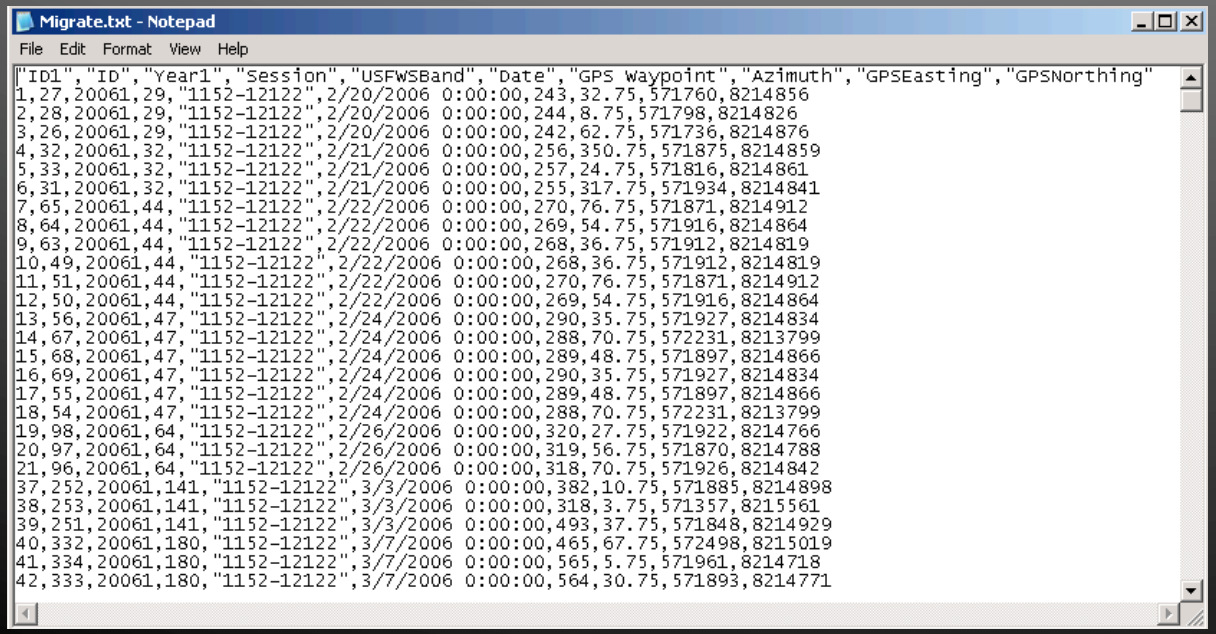
Working with Large Data Set

1. *Tuamotu Kingfisher data!!*
   - *Collected over several years.*
   - *Filtered for your benefit.*
   - *Compiled for this exercise.*

Data Organization

- *Data organization*
  - Tab delimited.
  - Comma delimited text file.
  - Use any text editor.

- Required fields
  1. Bird identification.
  2. Bearing group identification.
  3. Corrected azimuth.
  4. Observer Location (X and Y coordinates).



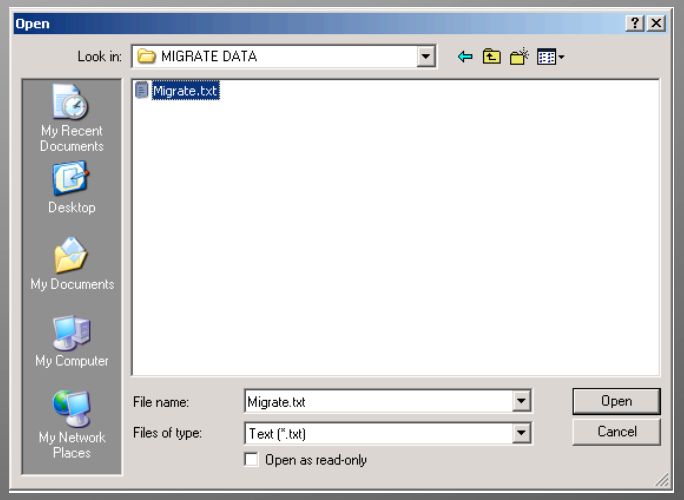
LOAS:
http://www.ecostats.com/

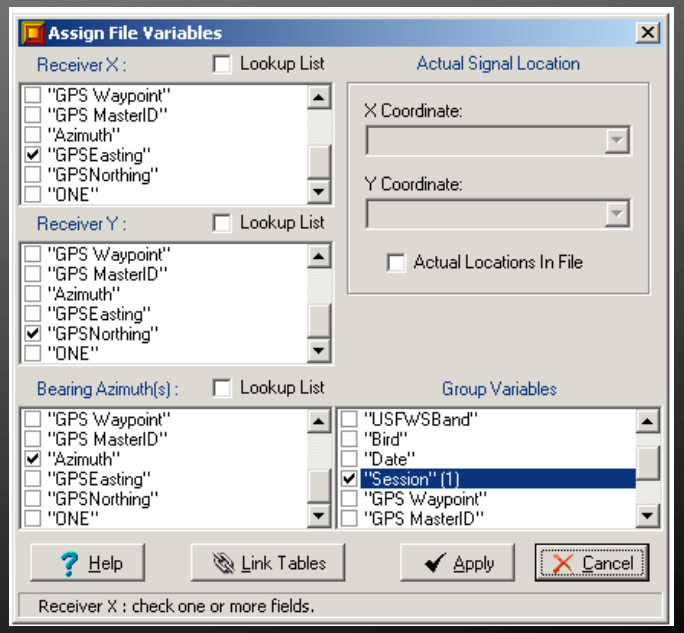
Data:
http://web.missouri.edu/keslerd
- download Migrate.txt

User ID: Dylan Kesler
Password1: 744708414-319204307
Password2: 846950847-362971027
Password3: 754783320-323519795
Password4: 664779665-284920722

Opening Data

1. *Start LOAS*
2. *Open File*
   a. *File, Open Data File*
   b. *Navigate to the Desktop*
   c. *Look in "MIGRATE" folder*
   d. *At bottom, select "File of Type = Text (*.txt)"*
   e. *Double click "Migrate.txt"*
3. *Defining File Variables*
   a. *Receiver X – select "GPSEasting"*
   b. *Receiver Y – select "GPSNorthing"*
   c. *Bearing Azimuth – select "Azimuth"*
   d. *Group Variables – select "Session"*
4. *Click Apply*

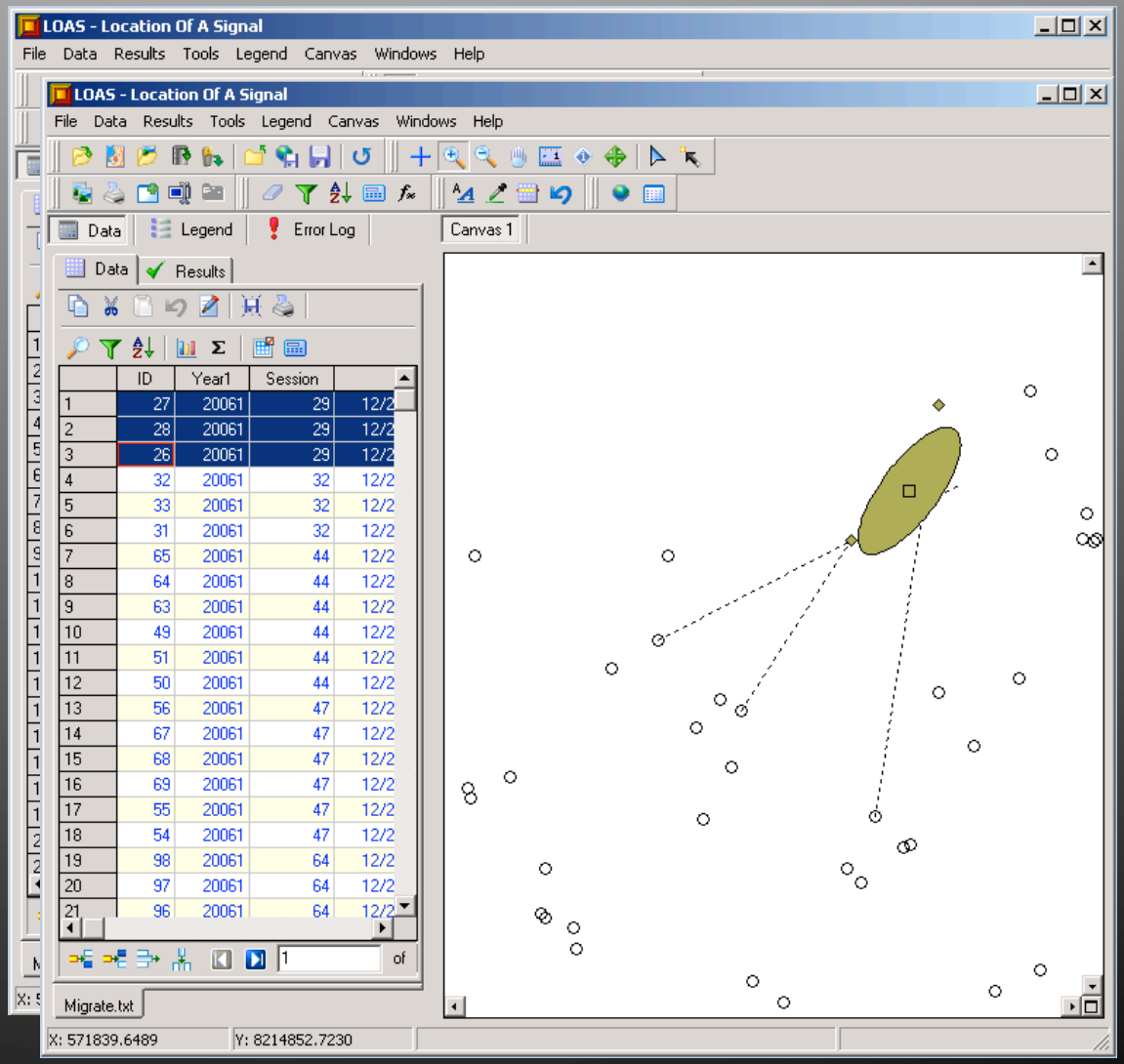




LOAS Screen Overview

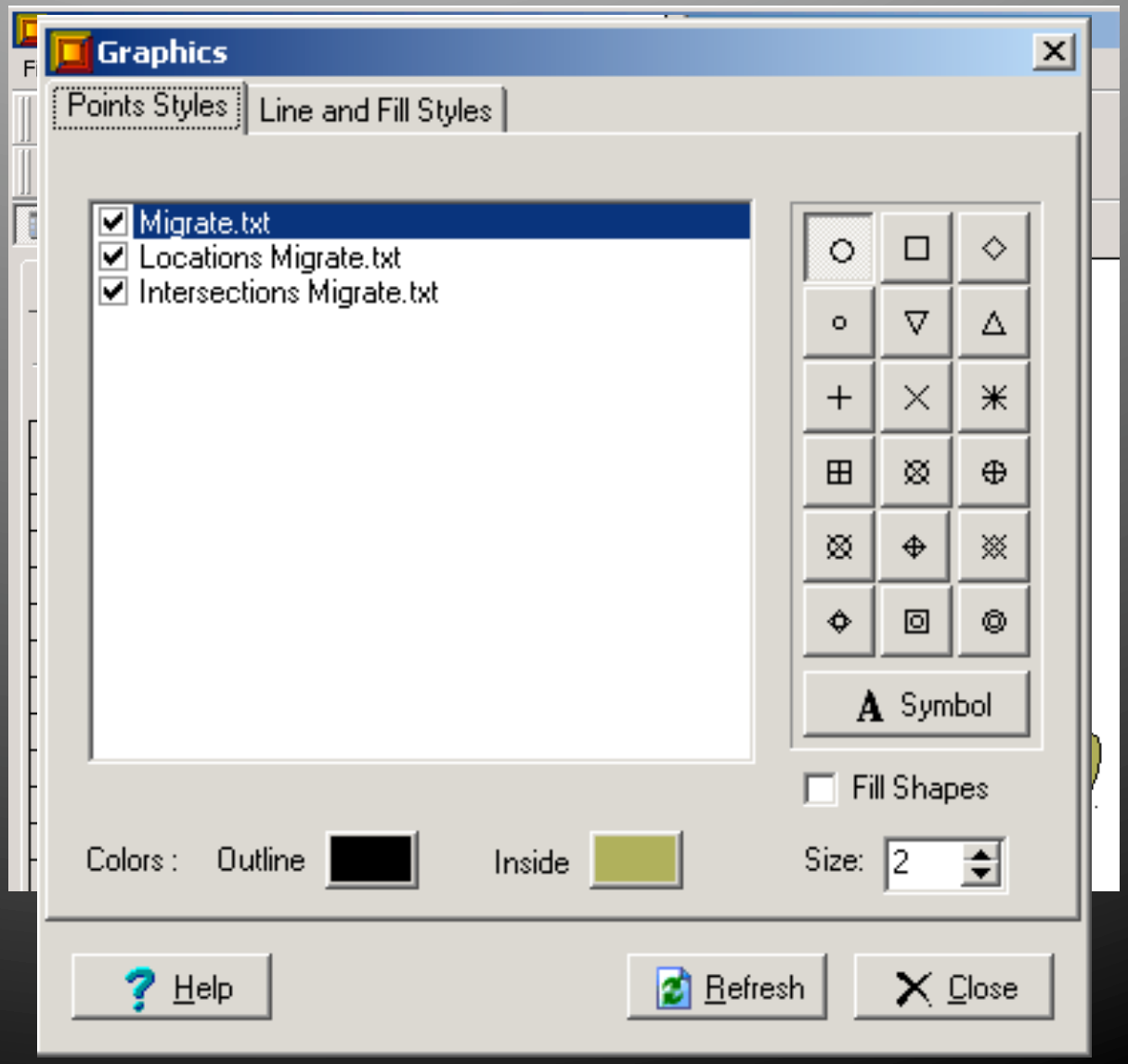
- *Data tab*
- *Results tab*
- *Observer locations*
- *Highlighting bearing groups (sessions)*

- *Exercise*
  - *a) Highlight lines 1,2,3 (session 29)*
  - *b) Click calculate*
  - *c) Zoom into center*
  - *d) Notice three bearings, intersections, estimated location.*
- *These are your estimated locations.*
- *Click the "Results" tab for coordinates.*



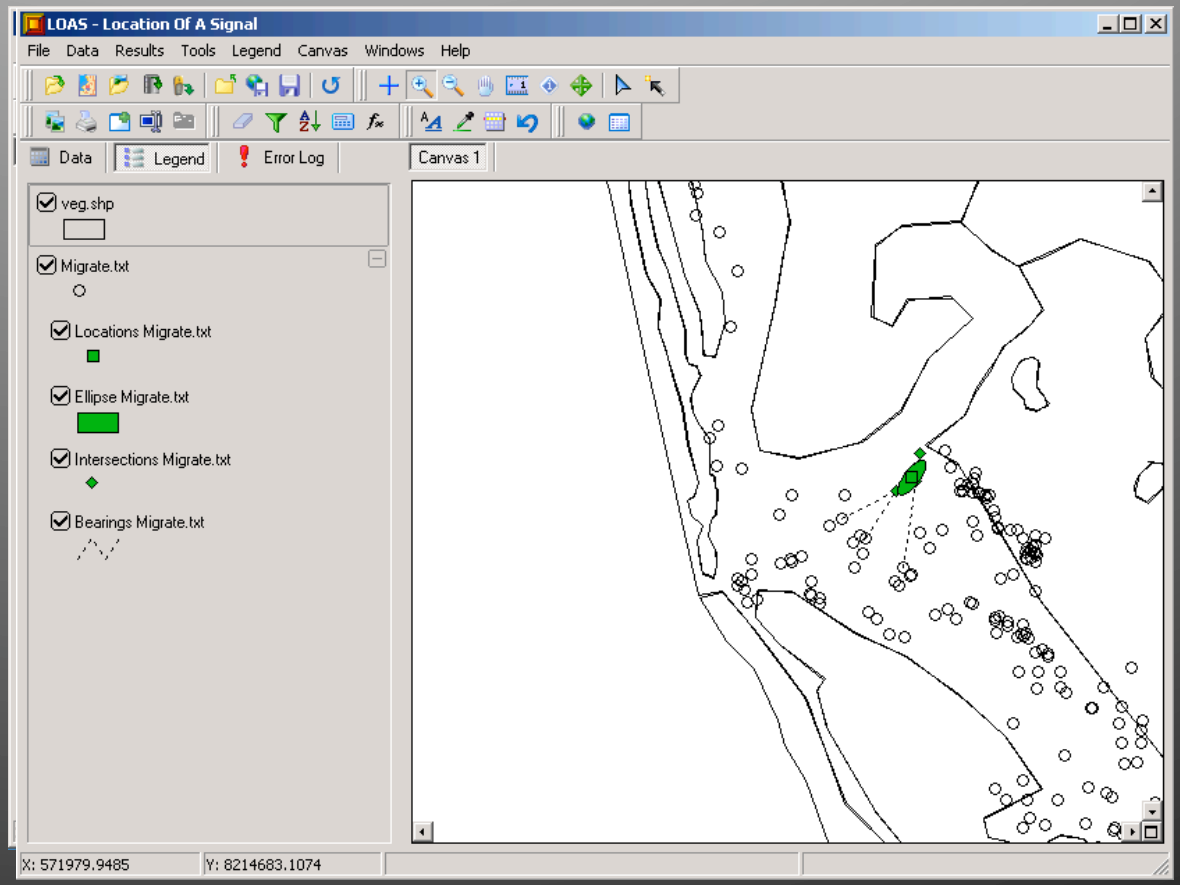
Adjusting View

- *Adjust symbols and colors*
  - *a) Click "Canvas"*
  - *b) Click "Shapes"*
  - *c) Click "Colors and Symbols"*
  - *d) Adjust colors and symbols.*



Adding Arc Shapefiles

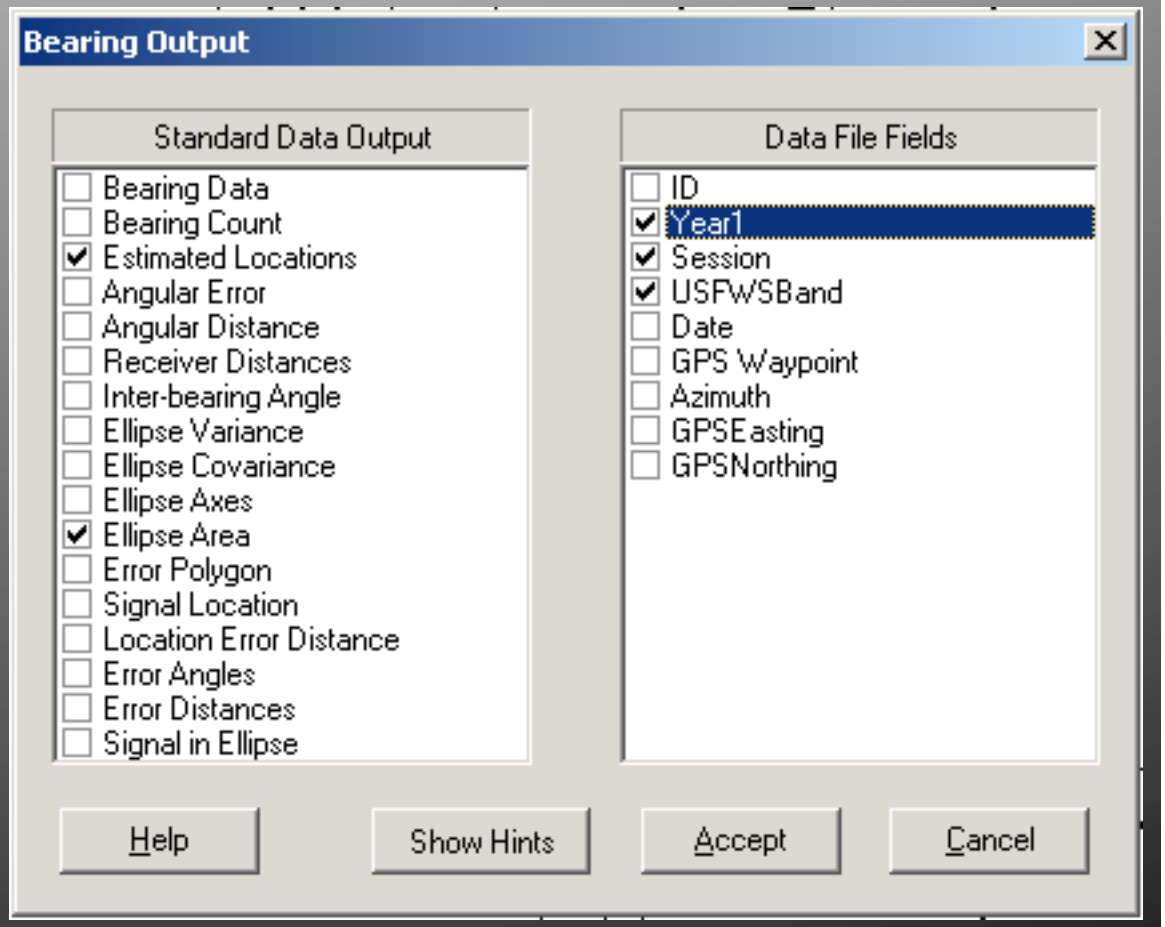
- *Add Vegetation Cover Layer*
  - a) *Click "File"*
  - b) *Click "Open Map Vector File"*
- *Navigate to the desktop and MIGRATE folder.*
  - a) *Select "Veg.shp"*
  - b) *You will see vegetation coverages for the island of Niau.*
  - c) *Observations are on the right*
-  *Zoom in with magnifying glass to see bird location within vegetation.*
- *This bird was located in coconut plantation!!!*



Running Batches of Data

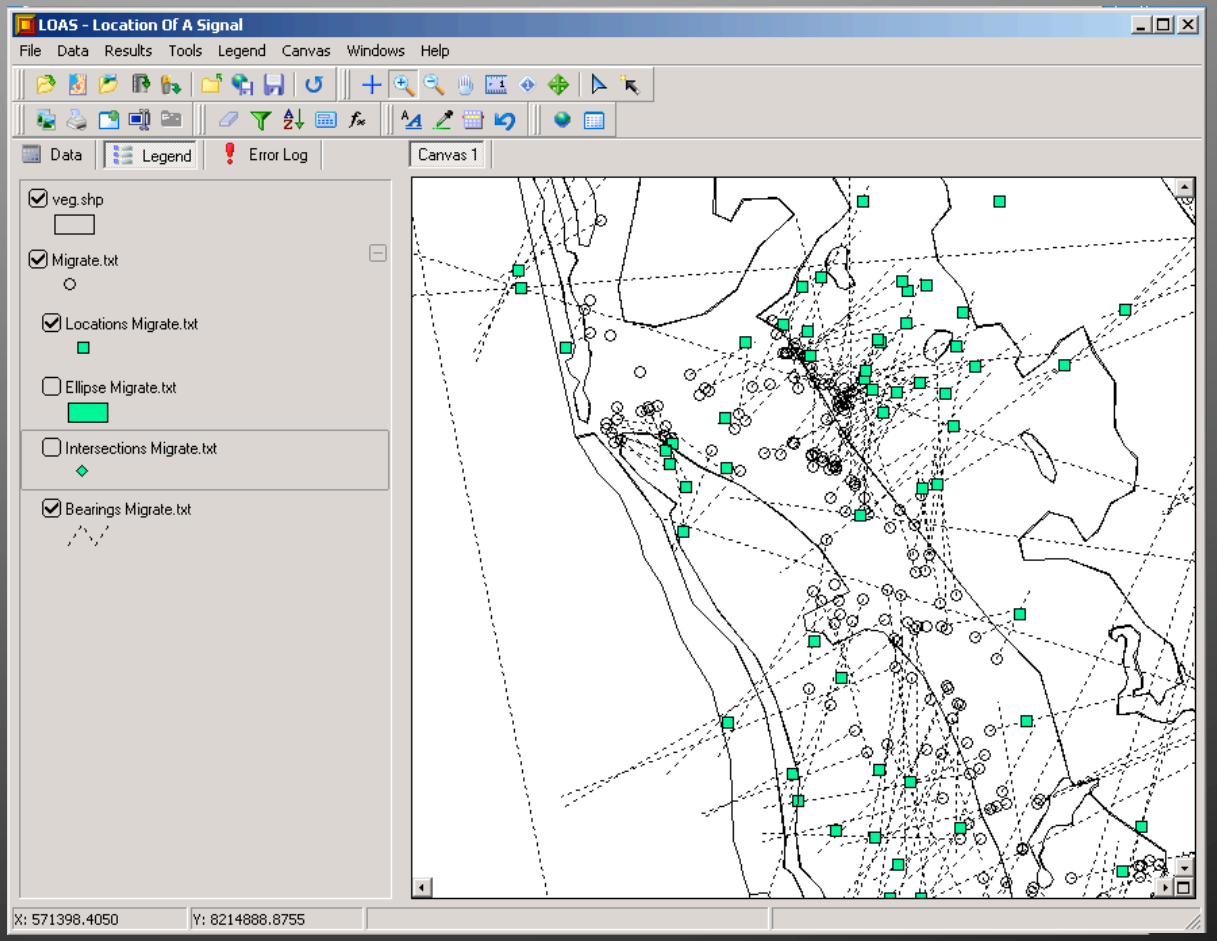
- *Click Results tab*
- *Clean Results*
  a) *Click results tab*
  b) *Erase results*

- *Select Output Variables*
  a) *Click "Results"*
  b) *Click "Select Output Variables"*
  c) *Select*
     - ✓ *Estimated locations*
     - ✓ *Ellipse area*
     - ✓ *Year1*
     - ✓ *Session*
     - ✓ *USFWS band*
  d) *Click Accept*



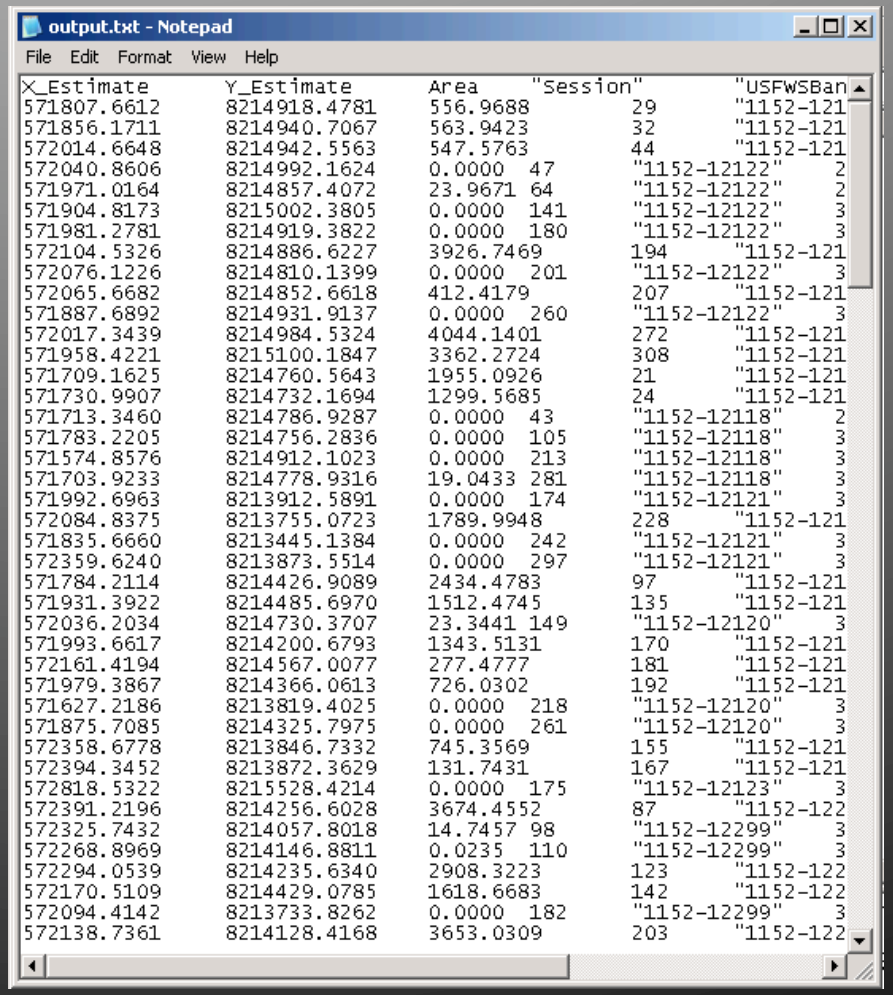
Generating Results

- *Run bearing session 29*
- *Click on "Results" tab*
  - a) *Scroll thorugh*
  - b) *Notice estimated bird location coordinates "X_Estimate" "Y_Estimate"*
  - c) *Notice the area within the error ellipse "Area".*
- *Run all data together*
  - a) *Clear results table*
  - b) *Select all rows*
  - c) *Click calculate*
  - d) *Look at results table!*
  - e) *Zoom in and look at points on map!*



Exporting Results

1. Click File, Save Data, Telemetry Results.
2. Save all data in grid, and click “Accept”
3. Select the file name, file type (txt works well for arc), and location. Click “Continue”
4. Click “Accept”
5. Done!
6. Double click file to open!
7. These data can be imported into ArcView and analyzed there.



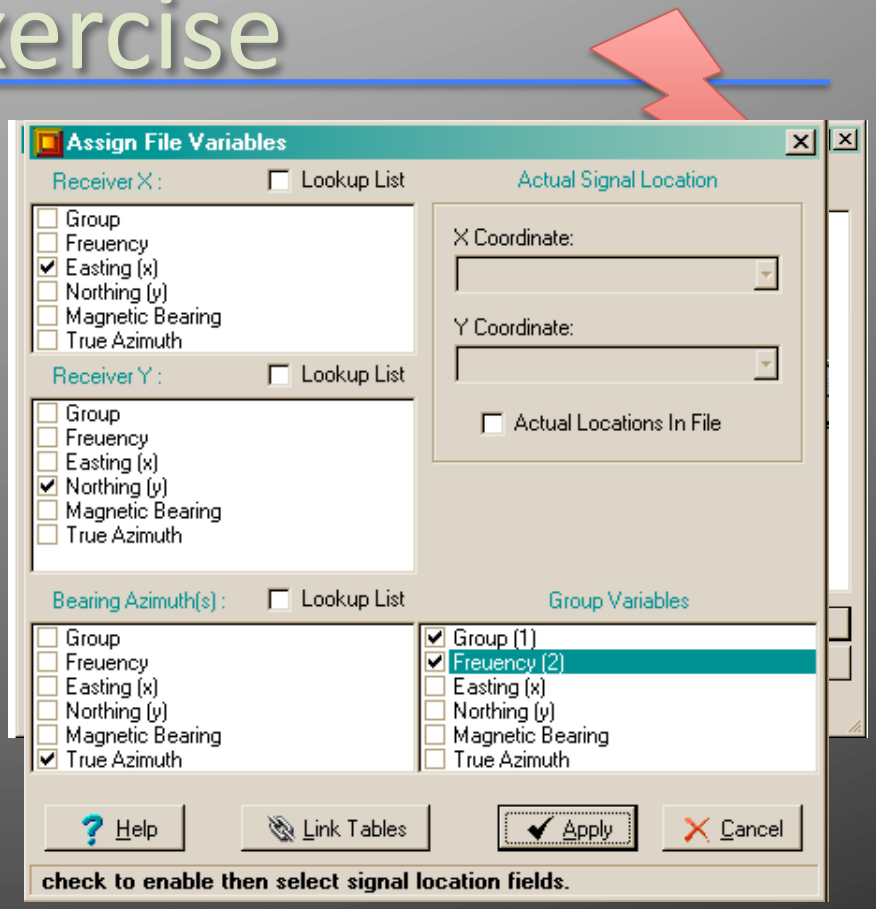
X_Estimate	Y_Estimate	Area	"Session"	"USFWSBan
571807.6612	8214918.4781	556.9688	29	"1152-121
571856.1711	8214940.7067	563.9423	32	"1152-121
572014.6648	8214942.5563	547.5763	44	"1152-121
572040.8606	8214992.1624	0.0000	47	"1152-12122" 2
571971.0164	8214857.4072	23.9671	64	"1152-12122" 2
571904.8173	8215002.3805	0.0000	141	"1152-12122" 3
571981.2781	8214919.3822	0.0000	180	"1152-12122" 3
572104.5326	8214886.6227	3926.7469	194	"1152-121
572076.1226	8214810.1399	0.0000	201	"1152-12122" 3
572065.6682	8214852.6618	412.4179	207	"1152-121
571887.6892	8214931.9137	0.0000	260	"1152-12122" 3
572017.3439	8214984.5324	4044.1401	272	"1152-121
571958.4221	8215100.1847	3362.2724	308	"1152-121
571709.1625	8214760.5643	1955.0926	21	"1152-121
571730.9907	8214732.1694	1299.5685	24	"1152-121
571713.3460	8214786.9287	0.0000	43	"1152-12118" 2
571783.2205	8214756.2836	0.0000	105	"1152-12118" 3
571574.8576	8214912.1023	0.0000	213	"1152-12118" 3
571703.9233	8214778.9316	19.0433	281	"1152-12118" 3
571992.6963	8213912.5891	0.0000	174	"1152-12121" 3
572084.8375	8213755.0723	1789.9948	228	"1152-121
571835.6660	8213445.1384	0.0000	242	"1152-12121" 3
572359.6240	8213873.5514	0.0000	297	"1152-12121" 3
571784.2114	8214426.9089	2434.4783	97	"1152-121
571931.3922	8214485.6970	1512.4745	135	"1152-121
572036.2034	8214730.3707	23.3441	149	"1152-12120" 3
571993.6617	8214200.6793	1343.5131	170	"1152-121
572161.4194	8214567.0077	277.4777	181	"1152-121
571979.3867	8214366.0613	726.0302	192	"1152-121
571627.2186	8213819.4025	0.0000	218	"1152-12120" 3
571875.7085	8214325.7975	0.0000	261	"1152-12120" 3
572358.6778	8213846.7332	745.3569	155	"1152-121
572394.3452	8213872.3629	131.7431	167	"1152-121
572818.5322	8215528.4214	0.0000	175	"1152-12123" 3
572391.2196	8214256.6028	3674.4552	87	"1152-122
572325.7432	8214057.8018	14.7457	98	"1152-12299" 3
572268.8969	8214146.8811	0.0235	110	"1152-12299" 3
572294.0539	8214235.6340	2908.3223	123	"1152-122
572170.5109	8214429.0785	1618.6683	142	"1152-122
572094.4142	8213733.8262	0.0000	182	"1152-12299" 3
572138.7361	8214128.4168	3653.0309	203	"1152-122

Field Exercise

1. *Working with data*
2. *Download file from:*

http://idisk.mac.com/keslerd-Public/migrate

**** click the arrow at the lightning bolt!*



1. *Start LOAS*
2. *Open File*
   a. *File, Open Data File*
   b. *Open file you downloaded*

3. *Defining File Variables*
   a. *Receiver X – select "Easting (x)"*
   b. *Receiver Y – select "Northing (y)"*
   c. *Bearing Azimuth – select "True Azimuth"*
   d. *Group Variables – select "Group and Frequency"*

4. *Click Apply*

Play With Field Data

- *Data tab*
- *Results tab*
- *Observer locations*
- *Highlighting bearing groups (sessions)*

- *Exercise*
  - *a) Highlight first bearing group*
  - *b) Click calculate*
  - *c) Zoom into center*
  - *d) Notice three bearings, intersections, estimated location.*
- *These are your estimated locations.*
- *Click the "Results" tab for coordinates.*

Additional Information

Millspaugh, J. J., and J. M. Marzluff. 2001. Radio Tracking And Animal Populations. Academic Press, San Diego.

White, C. C., and R. A. Garrott. 1990. Analysis of Wildlife Radio-tracking Data. Academic Press, San Diego.

Kenward, R. E. 2001. A Manual for Wildlife Radio Tagging. Academic Press, San Diego.